STATE OF CALIFORNIA EDMUND G. BROWN JR., *Governor*

PUBLIC UTILITIES COMMISSION
505 VAN NESS AVENUE
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FILED
8-17-15
11:13 AM

August 17, 2015

Agenda ID #14221
Quasi-Legislative

TO PARTIES OF RECORD IN RULEMAKING 13-12-011:

This is the proposed decision of Commissioner Sandoval. Until and unless the Commission hears the item and votes to approve it, the proposed decision has no legal effect. This item may be heard, at the earliest, at the Commission's September 17, 2015, 2015 Business Meeting. To confirm when the item will be heard, please see the Business Meeting agenda, which is posted on the Commission's website 10 days before each Business Meeting.

Parties of record may file comments on the proposed decision as provided in Rule 14.3 of the Commission's Rules of Practice and Procedure.

/s/ KAREN V. CLOPTON
Karen V. Clopton
Chief Administrative Law Judge

KVC:avs

Attachment

Decision **PROPOSED DECISION OF COMMISSIONER SANDOVAL**
(Mailed 8/17/2015)

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking into Policies to Promote a Partnership Framework between Energy Investor Owned Utilities and the Water Sector to Promote Water-Energy Nexus Programs.	Rulemaking 13-12-011 (Filed December 19, 2013)

DECISION REGARDING TOOLS FOR CALCULATING THE EMBEDDED ENERGY IN WATER AND AN AVOIDED CAPACITY COST ASSOCIATED WITH WATER SAVINGS

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DECISION REGARDING TOOLS FOR CALCULATING THE EMBEDDED ENERGY IN WATER AND AN AVOIDED CAPACITY COST ASSOCIATED WITH WATER SAVINGS

Summary

In this decision, we adopt new tools that will allow the Commission to better quantify the benefits of water-saving programs. The Commission has long had tools in place for measuring direct energy savings associated with reduced water use. These tools, however, have only taken account of site-specific energy savings to the customer, such as a reduced need for energy to heat water on site. The new tools allow for quantifying additional energy savings from reduced water use.

- The first tool is the Water-Energy Calculator (W-E calculator).[1] The W-E calculator quantifies how much electric energy it takes to move and treat water, and calculates the associated indirect energy savings benefits. It enables evaluation of *energy* savings associated with *cold water*-savings[2] measures as well as the off-site energy savings of hot water savings that existing tools quantify. Adopting the W-E calculator is a critical step towards valuing "upstream" and "downstream" energy use, and in turn making more *energy* efficiency funding available for *water* savings programs. W-E calculator outputs will inform analysis of the cost-effectiveness of energy utility participation in water savings programs. The W-E

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[1] http://www.cpuc.ca.gov/NR/rdonlyres/D32A349D-8DF8-4FB6-BE51-7EDDC96B3BD9/0/CPUCWaterEnergyCalculatorVersion103PublicDRAFT.XLSM

[2] "Cold water savings (related to the production, transportation and treatment of water)," D.07-12-050, at 8, are distinct from "hot water savings (those related to reducing the use of energy to heat water for end-use purposes)." *Id.*

calculator also calculates the water resource benefits associated with water savings.

- The second tool is the Avoided Water Capacity Cost Model (water tool).[3] The water tool calculates an avoided water system capacity cost associated with water savings. Water tool output is an essential input into the W-E calculator.

We also address how to allocate program costs and benefits among program administrators (PAs) for purposes of determining cost effectiveness for each PA. Finally, we address coordination of output from the W-E calculator with existing energy efficiency cost effectiveness calculators.

We thank the parties, Commission Staff, and the Commission's consultants (Navigant Consulting and GEI Consultants) for the time and effort they have put into development of these tools. We are pleased with the degree of consensus reached over the tools. Various parties propose relatively minor changes to the tools, and propose some limitations on the tools' use. Overall, though, there is agreement that the tools offer a real advance in measuring the costs that cold-water saving measures avoid, and are ready for "prime time."

This proceeding remains open.

1. Procedural and Factual Background

For nearly a decade the Commission has worked to address the confluence of energy and water use – the "water-energy nexus." As the Commission observed in 2007:

> It is obvious that it takes energy to produce, deliver, and dispose of potable water. It can take energy to push or pull the water from the

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[3] http://www.cpuc.ca.gov/NR/rdonlyres/4ED08241-12F9-493D-A249-307144388BA1/0/CPUCAvoidedWaterCapacityCostModelVersion103PublicDRAFT.XLSM

> place where nature produces it to the place where it is needed . . . . It often takes energy to move the water to storage or to deliver it to a customer. It takes energy to clean the water again after it becomes waste and before it can be released to the greater environment. And if it takes energy to use water, then it must save energy if one can avoid using it.[4]

The Commission-chartered 2010 Embedded Energy in Water Studies, Study 1: Statewide and Regional Water-Energy Relationship (Study 1).[5] That study concluded that the supply, treatment, and conveyance of water (as distinct from end use heating of water) makes up 7.7% of statewide electricity use (19.3 Terrawatt hours [TWh] annually).[6] Saving cold water saves energy; potentially a lot of energy. But how should the Commission capture those savings?

Factoring cold-water energy savings into energy efficiency program development and evaluation requires quantifying how much energy it takes to move and treat cold water – so-called *embedded energy*. The need for tools

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[4] Decision (D.) 07-12-050, at 29.

[5] ftp://ftp.cpuc.ca.gov/gopher-data/energy%20efficiency/Water%20Studies%201/Study%201%20-%20FINAL.pdf

[6] Study 1, Appendix N, Table N-1. ftp://ftp.cpuc.ca.gov/gopher-data/energy%20efficiency/Water%20Studies%201/Appendix%20N%20-%20Comparison%20of%20Study%201%20and%202%20-%20FINAL.pdf Note that this percentage *does not include energy associated with end uses of water*, (e.g., water heating). Thus the figure here is lower than the 2005 California Energy Commission (CEC) estimate that water-related energy accounts for about 19.2% of the state's electricity requirements and 30% of non-power plant related natural gas consumption. The CEC figures *did* include end-use energy consumption, and so were higher than the figures given in Study 1. As noted earlier, tools are already in place to capture savings from end-use reductions in water use. We are concerned in this decision with quantifying energy savings elsewhere, i.e., the 7.7% figure that Study 1 identifies.

specifically for quantifying energy savings from water-energy nexus measures[7] has long been apparent. In 2006, parties filing comments in R.06-04-010, an energy efficiency rulemaking:

> agreed that (1) by saving water or developing and treating it more efficiently, it is possible to produce significant energy savings, (2) energy efficiency programs could be more effective if the electric and gas utilities were to promote water efficiency improvements that would provide cost effective energy savings, and (3) there is a shared sense of urgency to begin accounting for this energy savings potential and incorporating it into the design of the energy efficiency programs."[8]

Quantification of embedded energy has not, to date, happened with sufficient rigor to justify using energy customer dollars to fund cold-water savings programs outside of pilot programs. Currently, the energy efficiency[9] calculators do not account for – and so energy utilities receive no savings credit for – energy used to supply, treat, and convey cold water.

We maintain two calculators to gauge the cost-effectiveness of energy efficiency programs. The first calculator is the energy Avoided Cost Calculator

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[7] "For purposes of this Rulemaking, we will use the following simplified definitions. As used here, the phrase "energy efficiency" encompasses both energy efficiency and conservation. A "portfolio" is a collection of "programs." Programs, in turn, consist of "measures." "Administrators" design and administer portfolios. "Implementers" implement programs. We recognize that these terms and phrases have become terms of art, each with their own complexities, subtleties and nuances. For this decision, we are deliberately setting those complexities, subtleties and nuances aside to make this document more accessible to lay readers." (Rulemaking (R.) 13-11-005, at 2, n. 3.)

[8] D.07-12-050, at 7.

[9] On the water side, there is currently no Commission-approved cost calculator for estimating the avoided cost of water capacity.

Avoided Cost Calculator.[10] It determines the avoided costs of supplying electricity and natural gas on a per unit basis ($/kilowatt hour and $/Therm). Avoided costs are the primary benefits associated with efficiency and conservation programs. The Avoided Cost Calculator estimates how much a utility would have to spend to provide service if the program did not reduce consumption. These avoided costs serve as inputs into the calculator we discuss next.

The second calculator is the Cost Effectiveness Calculator. It uses measurable costs and benefits to estimate program cost effectiveness. The Cost Effectiveness Calculator combines the estimates of program benefits (i.e., avoided direct energy costs) from the Avoided Cost Calculator with estimated costs and other data (e.g., administrative costs, equipment useful lifetimes). It then calculates results, usually in the form of benefit-cost ratios, for each program and so for portfolios of programs.

As we noted earlier, neither of these calculators considers the *embedded energy* benefits of water savings. We have explicitly recognized this fact, and in D.12-05-015[11] we said that it is "not prudent to spend significant amounts of [energy] ratepayer funds on expanded water-energy nexus programs until the cost-effectiveness of these programs, and particularly the net benefits that accrue to energy utility ratepayers, are better understood."[12] Accordingly, we directed Commission Staff to:

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[10] There are separate Avoided Cost Calculators for electricity and for gas. We will treat these as a single calculator for discussion purposes in this decision.

[11] For a background on the genesis of this proceeding, *see* R.13-12-011, at 3-7.

[12] D.12-01-015, at 283.

> address appropriate methods for calculating energy savings and cost-effectiveness in the water-energy context, issues associated with the joint funding and implementation of water-energy programs by the IOUs and water entities, and the development of an updated water-energy cost-effectiveness calculator and appropriate methodologies for calculating the GHG emission reductions associated with water-energy nexus programs.[13]

For energy utilities, the Commission approves ratepayer funding for various water-saving measures as part of numerous energy efficiency programs. Program Administrators (PAs),[14] as their title implies, administer portfolios of these programs. Examples of water-saving measures that energy utilities have funded are low-flow showerheads (a residential measure, generally), and high-efficiency cooling towers (a commercial and industrial measure).

We funded these water measures through energy utilities because they yield measurable on-site energy savings. That is, adoption of these water-saving measures reduces electricity or gas use (or both) at a particular site, thus there are demonstrable savings from such programs even without considering embedded energy. A low-flow showerhead,[15] for instance, decreases hot-water consumption, and so decreases the need for gas or electricity to heat the hot water. A high-efficiency cooling tower uses less water per unit of cooling, and so

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13 D.12-10-015, at 284-85.

14 Program administrators are Bay Area Regional Energy Network (BayREN), Marin Clean Energy (MCE), Pacific Gas and Electric Company (PG&E), San Diego Gas & Electric Company (SDG&E), Southern California Edison Company (SCE), and Southern California Gas Company (SoCal Gas). Not all PAs necessarily offer all of the measures discussed here.

15 We note that some historic water-saving measures with direct energy benefits are now required by code, and so no longer are eligible for energy efficiency funding. Low-flow showerheads are such a measure. (*See* Title 24, Part 11, section 5.303.3.3.1)

uses less energy to pump water through the cooling system than a less-efficient tower. The Cost Effectiveness Calculator already captures those site savings when evaluating a program's cost-effectiveness.

Low-flow showerheads and high-efficiency cooling towers also reduce *cold-water* use, of course. However, without tools such as those under evaluation in this proceeding, the Commission has lacked a way to quantify any energy savings associated with reductions in cold-water use. Accordingly, we have been unable to consider such savings in evaluating the energy the measure saves.

We have been exploring the merits of increased energy ratepayer funding for (and crediting IOUs with savings from) water-energy nexus programs for some time now. The Commission has already approved a variety of cold-water pilot programs for energy utilities.[16] However, any expansion of these pilots requires the ability to calculate "energy savings and cost effectiveness in the water-energy context."[17]

We opened this proceeding in response to an Office of Ratepayer Advocates (ORA) petition. In this proceeding, we tasked ourselves with developing "methodologies for measuring the embedded energy savings from energy efficiency and conservation measures in the water sector."[18] We believed that we could more readily develop such methodologies in this "new, narrowly-focused rulemaking"[19] than in a wider-ranging docket. We have since

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16 *See* D.07-12-050 (Order Approving Pilot Water Conservation Programs within the Energy Utilities' Energy Efficiency Programs); *see also* D.12-10-015, at 282-83 (discussing leak detection pilot program approved in D.07-12-050).

17 D.12-10-015, at 284.

18 R.13-12-011, at 2.

19 R.13-12-011, at 16.

broadened the proceeding's scope,[20] but have kept sight of this original objective. The immediate need was and is to develop and approve a method of determining the avoided cost of embedded energy in water.

The Commission contracted in 2013 with Navigant Consulting[21] to develop tools for valuing both the embedded energy in water and the capacity cost of new water supplies. Prior to the start of this proceeding, Commission Staff worked with a Project Coordination Group (PCG) on development of these tools. On December 13, 2013, we conducted a prehearing conference in this proceeding.[22] We then conducted three public workshops devoted to the two tools.[23] Staff issued reports from each of the first two workshops, which we served with rulings requesting public comment.[24] Various parties[25] provided

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[20] *See* D.15-01-028 (amends Order Instituting Rulemaking to expand scope and to add respondents).

[21] Navigant Consulting subcontracted with GEI Consultants in preparing the tool. For ease of reference, we will collectively refer to Navigant Consulting and its subcontractor as "Navigant."

[22] For the sake of brevity, we omit discussion of the pre-proceeding work undertaken by Commission Staff, their consultants, and a Project Coordination Group (PCG). Those efforts laid the foundation for what we decide here, and we appreciate their efforts.

[23] The first workshop took place on April 25, 2014. The second workshop took place on July 1, 2014. The third workshop took place October 14, 2014.

[24] The ruling related to the first workshop issued July 18, 2014. The ruling related to the second workshop issued August 29, 2014.

[25] The following parties filed comments in response to the July 18, 2014 ruling:

ACWA
California Farm Bureau Federation
MWD
ORA
PG&E

Footnote continued on next page

comments in response to one or both of the first two workshops (and the associated workshop reports). The Assigned Commissioner then conducted an all-party workshop[26] to take additional stakeholder input.

After receiving comments, Navigant, in conjunction with Commission Staff and the assigned Commissioner's office, made various changes to the tools. The tools under consideration in this proposed decision are the most recent iterations of the tools.[27] We put the last iteration of the tools, and an associated report, out for comment.[28] Parties then filed comments on the last versions of the

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San Diego County Water Authority
San Francisco Bay Area Regional Energy Network
SCE
NRDC
UCAN
Water Energy Innovations, Inc.

The following parties filed comments in response to the August 29, 2014 ruling:

ACWA
Irvine Ranch Water District
MWD
NRDC
ORA
PG&E
San Diego County Water Authority
SCE
SDG&E
SoCalGas
TURN
UCAN
Water Energy Innovations, Inc.

[26] The all-party workshop took place February 11, 2015.

[27] Versions 1.04 of the W-E calculator. Version 1.04 of the water tool.

[28] *See* ALJ ruling dated May 11, 2015.

tools. Finally, on May 4, 2015, we conducted a workshop on cost allocation issues. We requested,[29] and parties filed, comments on the tools and the cost allocation workshop on June 1.

2. Issues Before the Commission

The questions before us are:

1. Whether to adopt one or both of the tools?
2. Should either or both tools be adopted as-is or with modifications?
3. For what purpose(s) should either or both tools be adopted?
4. Subject to what limitations (e.g., cost allocation/budgeting) should either or both tool be adopted?

Which issues do we need to decide in a later phase of this proceeding and which can be deferred to other proceedings (e.g. the purpose(s) for which jurisdictional utilities are to use either or both tools?)

3. Jurisdiction

The Commission has jurisdiction to authorize (or mandate) that jurisdictional water, gas, and electric corporations use the tools or the tools' outputs. (*See* Public Utilities Code §701, §§381.1 et seq., and § 454.5(b)(9)(c).) The Commission also has jurisdiction to require jurisdictional water, gas, and electric corporations to provide data for incorporation into the tools. (*See* Public Utilities Code §§ 581 et seq.)

Some state and municipal water utilities have expressed concern that adoption of a tool for measuring energy embedded in water, and/or measuring water capacity costs, is an assertion of Commission jurisdiction over such municipal utilities. To be clear, we are not here asserting any jurisdiction over

[29] *See* ALJ ruling dated May 26, 2015.

municipal utilities. We are putting the tools into the public domain. *Any* entity *may* use the tools, whether jurisdictional or not. Jurisdictional utilities may use these tools while working with eligible customers in their service territories to evaluate whether energy efficiency or other measures would be cost effective or achieve program goals.

4. Discussion and Analysis

4.1. The Theoretical Elephant in the Room - Whether Water – Saving Measures Reduce Overall Water Consumption

Before we turn to the particulars of the tools, we will discuss the threshold question of whether water saving measures actually reduce overall water use. The theoretical "elephant in the room"[30] is that the cold water savings measures might not actually reduce the total amount of water drawn from the ground and rivers, moved and treated for use. One theory posits that cold-water savings measures may just shift *who* uses the water, and/or *when* someone uses the water. Even with a measure in place, the "saved" water may still be used by someone else, or stored for use later, and still pumped and treated before and (for urban users) after use. Consequently, according to this theory, water-saving measures might not save any energy, undercutting the justification for using energy customer money to pay for cold-water savings.

At the October 14, 2014 workshop, participants discussed how, in a time of general water scarcity, one water user's reduced use might not necessarily

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30 The PCG adopted this moniker in its white paper (PCG white paper) that we circulated for comment via ruling dated April 29, 2015 (Administrative Law Judge's Ruling Seeking Post-Workshop Comments on Tools for Calculating: (1) Embedded Energy in Water And (2) An Avoided Capacity Cost Associated with Water Savings) (April 29 ALJ ruling).

reduce aggregate water consumption. That is, if user X reduces water use, there is more water available for user Y, who may increase usage accordingly. Alternatively, there is more water available for storage and use later. In either scenario, arguably, there may be no reduction in marginal water use, and so no energy savings associated with X's reduced water use.

The PCG took this issue up in a paper that it issued (PCG white paper). The relevant material begins on page 15, under the subheading of "Discussion: The Elephant in the Room." Here is how the PCG paper introduced what it describes as this "formidable issue:"

> The movement of water by wholesale conveyance works is not directly linked to retail water sales. This is due to a major distinction between energy supply systems, particularly for electric power, and water supply systems. Electric power systems generally lack utility-scale storage, and consequently they convey supplies to end users in real time. A reduction in electricity sales is linked to a reduction in energy generation. In contrast, water supply systems have utility-scale storage, for example, [The Metropolitan Water District of Southern California (MWD)] has access to about 5.6 million acre-feet of groundwater and surface dry year storage nearly three times its average annual deliveries. Thus, water supplies that are procured by wholesale suppliers are often not immediately conveyed to end users.[31]

The PCG paper notes a lack of unanimity on whether "end-use water savings will achieve reliable energy savings and associated GHG reductions from the large scale water conveyance systems." The PCG paper's discussion of this issue closes with the following admonition:

> Given the place of energy efficiency at the top of the CPUC's loading order for new energy resources, it is imperative for the reliability of

[31] PCG white paper, at 17.

> the power system that public goods charge investments in energy efficiency save energy in a reliable and predictable way. This issue needs further evaluation. It is not simply a computational problem, but a significant policy gap that needs attention as well. Energy and GHG savings ought not to be credited to water conveyance facilities without a mechanism to ensure that the savings are real.

The W-E calculator and the water tool do not explicitly account for water program savings being stored or otherwise taken up by another user. The tools depend on the assumption that individual customers saving water translates to a (literally) upstream reduction in energy use. The April 29 Administrative Law Judge (ALJ) ruling asked parties to comment specifically on whether the W-E calculator should consider this possibility, and, more generally, how we could "ensure that [water-energy] savings are real?"[32]

Energy-oriented parties'[33] comments did not address this question.

San Diego County Water Authority (SDCWA) asserted in comments that stored water does not forestall the need to use more energy intensive water supplies or new water purchases. According to SDCWA, "future core supplies that would need to be developed to meet rising demands would be considered "marginal supplies", the embedded energy of which the model already captures."

MWD asserted in its comments that "In the short-run, a gallon of water saved by a conservation intervention on a particular day will save the energy associated with the end use, energy from treatment and distribution, as well as the energy for wastewater treatment (for indoor end uses). In the long-run,

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32 April 29 ALJ ruling, at 5-6.

33 I.e., PG&E, SDG&E, SCE, SDG&E, SoCal Gas, TURN, and UCAN.

conservation reduces the overall demand for water for a service area, and therefore the embedded energy as well."[34]

Since those comments were received, Governor Brown issued an Executive Order on April 1, 2015 ordering mandatory water cutbacks for urban water users. Individual communities received cutback mandates ranging from 4-36%, depending on their previous levels of conservation or water usage. Communities who had used the most water in 2014 received the highest water cutback mandates. This Executive Order applies to all water utilities, whether Investor-Owned, Municipal, or Mutual. The CPUC adopted Resolution W-5034, dated April 9, 2015, and Resolution W-5041, dated May 7, 2015, requiring Commission jurisdictional water utilities to comply with the SWRCB's Emergency Regulations and with Governor Brown's Executive Order directing water utilities to achieve specific water cutback levels in the communities they serve. In Resolution W-5034, the Commission stated that it "invites bold proposals and expects to receive schedules that include provisions for, but not limited to, (1) mandatory water audits; (2) customer funded remotely read water meters; (3) restriction on water use for the top residential, commercial and industrial users; (4) flow restrictor requirements; (5) restrictive outdoor watering rules; and (6) limits on total water use." Water utilities must report to the State Water Resources Control Board (SWRCB) on their water "production," how much water they are producing for customer consumption on a monthly basis.

With mandatory urban cutbacks, water saved is not merely available to another urban user. The intent of Governor Brown's Executive Order was to

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[34] MWD June 10, 2015 comments, at 4-5.

cutback water use through both immediate steps to conserve water, and through long-term measures to embed water savings. The Executive Order recognizes that "a distinct possibility exists that the current drought will stretch into a fifth straight year in 2016 and beyond" presenting "urgent challenges including: drinking water shortages in communities across the state, diminished water for agricultural production, degraded habitat for many fish and wildlife species, increased wildfire risk, and the threat of saltwater contamination to fresh water supplies in the Sacramento-San Joaquin Bay Delta." We note that agricultural water use has dropped as the Federal Water Project and the State Water Project have drastically cut back or eliminated water deliveries, even for those with contracts to buy water. While the Department of Food and Agriculture reports that many agricultural users are pumping groundwater to replace some of the water not delivered by the federal and state water projects, many fields have also been fallowed for lack of water.

We also note that previous measures to embed water savings by changing building codes to require more water efficient appliances such as toilets have contributed to decreasing water use for those types of appliances. Heather Cooley from the Pacific Institute estimated at the Governor's July 10, 2015 Water Tech Summit that in 1980, household toilet water use equaled almost 800,000 acre feet. If California had continued using 1980s toilet technology, that amount would be 1.2 million acre feet today. Instead, through codes, standards, and new technologies, California is using 640,000 acre feet less than that amount. Despite increases in population since their implementation, water use for appliances such as toilets decreased.

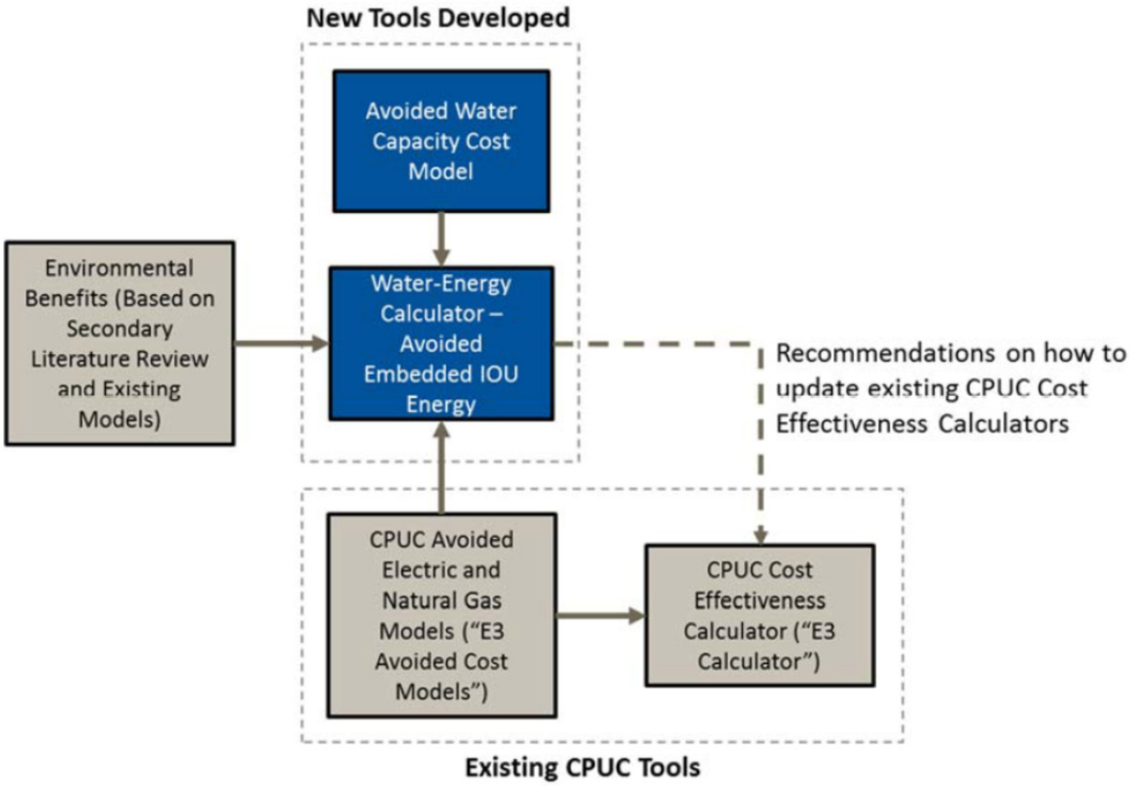
The Commercial and Industrial sector shares some features of the residential/urban sector in that buildings use water for restrooms, office kitchens, landscaping, and cooling. The Commercial/Industrial sector also uses water in its industrial process, whether for washing at an industrial scale, or for large-scale cooling, or other needs. Some Water IOUs have included Commercial/Industrial customers in their mandatory water cutback programs, while others are working closely with such customers and monitoring their progress before mandating cutbacks. In the Agricultural sector drip irrigation, sensors, evidence-based guidelines, and other methods may save water.

The foregoing, much of which predates the Governor's April 1, 2015 Executive Order mandating water cutbacks, give us sufficient comfort that the energy savings associated with cold-water saving measures are real to merit going forward with examining the new tools. The Governor's April 1, 2015 Executive Order and subsequent Commission Orders add urgency to our work to save water and thus embedded energy, and create more pathways to ensure that water will be saved and not merely transferred to other users. We remain aware of the prospect of individual water savings not reducing aggregate water consumption. We will monitor usage through the energy efficiency program, energy savings assistance program, other Commission programs that may use the cost-calculator tool, and reports of water IOUs, SWRCB, and other reports on water usage. We will analyze data on water conservation through the remaining topics in the scope of this proceeding.

4.2. The Tools

Conceptually, the water tool, the (already extant) Avoided Cost Calculator, and research on embedded energy in water are inputs into the W-E calculator. The output from the W-E Calculator then becomes an input into the Cost Effectiveness calculator. Thus, the two tools under review in this decision relate to the Commission's existing energy efficiency cost-effectiveness framework as follows:

Figure ES-1. Overview of Tools and Analysis Developed



Navigant identifies "the intended uses of the tools and analysis developed by [Navigant]"[35] as follows:

[35] Navigant Consulting, Water/Energy Cost-Effectiveness Analysis Final Report, Navigant Reference No.: 169145, October 7, 2014 (Navigant Report), at vii. Navigant identifies a third use for the tool and analysis: "Determine if incentivizing measures and programs that save both energy and water is a cost- effective use of IOU energy utility funds." This is not a task for the new Water-Energy Calculator tool itself. Rather, the tool provides an input into the energy cost-effectiveness analysis that we undertake using existing energy cost-effectiveness calculators, with. We discuss the interaction between the tool and existing cost-effectiveness calculators in more detail below.

• Estimate the IOU and non-IOU embedded energy savings that result from joint water-energy programs.

• Assess the benefits that accrue to energy utilities and to water utilities from programs and measures that save both energy and water.[36]

These are, in essence, the goals for the tools that we preliminarily placed in scope in R.13-12-011.[37] They accordingly set the benchmarks against which we will measure the tools.

The novelty of the tools made them challenging to evaluate. There are tools similar in some respects to the water tool,[38] but none are freely available and they do not precisely overlap with the water tool that Navigant has developed. We are treading new ground with the W-E calculator in particular. This means that we cannot calibrate the tools by comparing them with analogous other models. Moreover, the tools' *outputs* do not correspond to data that anyone tracks (as far as we are aware). This makes calibration using inputs from a past period and comparing outputs to actual data impossible. There are no "actual" data against which to compare.

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[36] *Id.*

[37] "At this time, we preliminarily determine that the following areas of concern are within the scope of this Rulemaking:

- The appropriate methodology for determining the energy embedded in water;
- The appropriate methodology for determining water system benefits to water sector partners, and other local, state, and federal entities to which such benefits may accrue." R.13-12-011, at 20.

[38] For instance, the Alliance for Water Efficiency (A4WE) makes a "tracking tool" available to its members. The "tracking tool" capability overlaps some with that of the water tool.

Accordingly, in order to decide whether to adopt the tools, we proceeded as follows. First, we considered the reasonableness of the general approach for each tool. Second, we looked at the reasonableness of the default assumptions the tools use, and whether/to what extent users can override defaults. Third, we invited parties to use the tools and comment on the reasonableness of their outputs.

Having engaged in this review, we find it reasonable to adopt the tools for the reasons and uses we detail below.

4.2.1. Water-Energy Calculator – Avoided Embedded IOU Water-Energy Calculator (W-E Calculator)

4.2.1.1. General Approach

Before investing in *water* efficiency to reduce *energy* consumption, we need to identify the source or sources of the water saved. Different water sources have different energy intensity associated with them. It takes more energy to pump water out of the ground or to desalinate water than it does to run water downhill from a nearby reservoir. So as a preliminary matter, the energy intensity of the target water supply needs to be understood. In many cases inadequate data mean there needs to be provide default estimates for energy intensity.

For purposes of setting up defaults, some aggregation of energy intensity is both practical and necessary. The W-E calculator borrows much of its approach from existing energy avoided cost methodologies. It:

- Compares alternative investment costs against the costs of water-saving measures;
- Is forward-looking (that is, the tools look at the *future* water source, not at existing water sources); and
- Makes compromises on spatial and temporal granularity.

Not all water providers in a given area will necessarily share a water source. However, as a practical matter we cannot develop defaults that will work for the thousands of water suppliers in energy utility service territories. We have to simplify to make the default analysis tractable. The framework the Commission adopts here contains a default set of values averaged across a hydrologic region.[39] As discussed below, we also allow user inputs to provide and share data on embedded energy in water, for example by Water IOUs and other water providers. This will allow for more granular and accurate data that accounts for differences in water supply.

With energy intensity in place, the next step is to determine the energy embedded in the water saved by virtue of the efficiency or conservation measure. This means, essentially, multiplying the energy intensity by the amount of water saved over the measure's useful life.

Finally, we need to assign a unit energy economic value (e.g., a $/kilowatt-hour value) to the embedded energy the measure saves. The W-E calculator uses values from the Avoided Cost Calculator (one of our existing energy efficiency cost calculators, as discussed above).

4.2.1.2. Inputs

The W-E calculator considers several costs that saving water might avoid. Those costs are detailed in the following sections.

4.2.1.2.1. Avoided Marginal Long-Run Regional Water Supply

Supply refers to the source of water and facilities it takes to move that water from source to point of treatment. Energy and cost can vary drastically across the different supply options in California. Consequently, the choices here

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39 http://www.water.ca.gov/serp.cfm?q=hydrologic+regions&cx=001779225245372747843%3Amxwnbyjgliw&cof=FORID%3A10&ie=UTF-8

are among the hardest we face in this decision. We discuss the relevant decision points and our resolution of each below.

Decision Point 1: Marginal or average supply cost?

Should we base avoided embedded energy values on average (i.e., current) or marginal (i.e., future) water supply costs? Previous water/energy studies have focused primarily on average water/energy supply issues.[40]

There are significant differences on a sub-regional scale in terms of average water supply due to:

- Historical water rights;
- Development history; and
- Local geography/water resources.

In contrast, marginal avoided water supplies have reasonable uniformity on a regional basis. Looking at marginal rather than average costs simplifies the analytical challenge considerably, and allows us to be forward-looking as we consider water supply to accommodate California's economic activity and projected population growth.

MWD urges "the Commission to consider using the embedded energy of the current water resource portfolio instead of a hypothetical future supply such as recycling or desalination." MWD contends this approach is simpler than looking at a marginal future resource.

[40] For instance, in D.07-12-050, at 41, for water-energy pilots we directed that: "For now, the Energy Division and the energy utilities should use a given water agency's *average energy intensity* for the purposes of ex ante evaluation." (emphasis added) The reason for this was that "we [were] not at a point where we [could] say, with confidence, what the avoided water source is for a given water agency." (*Id.)*

As just noted, any attempt to populate the tools with default values that are specific to individual utilities carries with it significant data availability challenges. More conceptually, by definition, a marginal supply is "on the margin", meaning that the "next" available supply when demand increases. As the Commission observed in D.07-12-050, looking at marginal supply "would produce better numbers than a utility's average energy intensity for water."[41] It is the margin – the next water resource we do not have to develop or procure – that matters, and so the W-E calculator correctly considers costs for the *marginal* supply (e.g., recycled water) rather than average supply.[42]

The default value for recycled water does not consider the cost of "purple pipe," a parallel piping infrastructure to deliver recycled water to the customer. CWA commented that this omission undervalues the cost of recycled water, but acknowledged that a purple pipe system is not necessary for recycled water. [43]

The W-E calculator's users can override the default value for water supply. This feature allows users to enter data for a variety of marginal water supply options, e.g. recycled water with or without purple pipe, desalination, etc. This will allow users to enter marginal supply options that may be most appropriate

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[41] D.07-12-050, at 42.

[42] Because our goal is to compare supplies "on the margin" with costs for efficiency/conservation, we will not treat conservation as the marginal supply. Doing that would mean comparing efficiency/conservation with itself, and render the tools useless for comparison purposes.

[43] "CWA also has concerns with Table ES-4, Annual Avoided Water Capacity Cost, which shows that the annual avoided water capacity cost for the water companies is greater in all cases than for the municipally owned water utilities. CWA notes that this will not always be the case as these values may be impacted by the partnership agreements governing water-energy conservation project." CWA June 10, 2015 comments, at 8, n. 9.

for their local circumstances. When overriding default values, users should continue to use values for a marginal supply; rather than for historical/existing supplies.

Decision Point 2: Short-run or long-run marginal supply (and choice of resource balance year)?

A major challenge for developing embedded energy values for marginal supplies is determining which supply is "marginal." Many water agencies examine marginal supplies in the short run. Further, many water agencies take into account factors other than cost or reliability concerns. For many agencies, legal and contractual obligations dictate supply source, although water suppliers have been forced to become creative during the drought and seek other sources when their supply source has been unavailable or substantially curtailed. The highly particularized nature of these obligations makes identifying marginal water supplies challenging. Moreover, for water agencies that have entered into water purchase agreements without "take or pay" obligations, the purchased water source could be considered the marginal water supply.

The practical upshot of these considerations is that many water utilities may regard imported water as their short-run marginal supply. "Utilities have identified their intra marginal source as their highest cost water, arguing that the water agencies are rational, cost-reducing entities that will reduce first where it will financially benefit them the most. The problem is that one source they have identified as an intra marginal source is the State Water Project water which although expensive, offers supplies that often can be put in storage.

Additionally, if a water agency reduces its take from the State Water Project one year, it may affect its ability to access more water the next."[44]

In D.07-12-052, in light of the foregoing, the Commission discussed how it might approach marginal supply when data became available. The Commission concluded that: "Ultimately, it would be logical to rely on extra-marginal supply assumptions for long term planning (more than one to two years in the future) and intra-marginal assumptions for the short term (one to two years ahead)."[45]

It is now eight years later. We have gained significant experience in collecting data on water supplies. Nonetheless, we still see significant problems with using short run marginal supply. The first is that data on short-run supplies remain hard to come by. The second is that imports continue to involve much energy that is not from jurisdictional energy companies. A third is that short-run supply options can vary enormously in cost from period to period, and from place to place.[46]

The W-E calculator addresses these concerns by using only the *long-run* marginal supply. The nature of long-run marginal supplies is a much simpler matter than short-run supplies. Not simple in absolute terms, certainly, but

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[44] D.07-12-052, at 41.

[45] D.07-12-052, at 41-42.

[46] MWD notes that "In the long-run, conservation reduces the overall demand for water for a service area, and therefore the embedded energy as well. As discussed in the Ruling, the saved embedded energy might not be realized immediately, and it may be spread across different IOUs. " For this reason, MWD "support[s] the use of long-term or annual regional averages of embedded energy for use in the tool as a reasonable approach that would allow energy investments in water conservation to proceed without delay." MWD June 10, 2015 comments, at 5. As discussed next, we are endorsing the tools' averaging of marginal costs across a wide geographic area as a default.

tractable, which is more than can be said of short run supply options. The universe of choices for new water in the end distills down to recycling and desalination. This is not without its nuances, and some areas may still have options like groundwater pumping. Still, for purposes of defaults, taking a long-run approach is the only practical option.

While we are discussing temporal issues, we note that the default assumption is that the long run begins immediately. The W-E calculator contains a default assumption that 2016 will be the "resource balance year" -- the year in which additional water capacity is needed.[47]

NRDC suggests that the Commission adopt a default resource balance year of 2021 (while continuing to allow users to modify this setting). NRDC points out that "the Water Conservation Act of 2009 requires retail water suppliers to reduce per capita water production by 10% by 2015 and 20% by 2020."[48] NRDC also argues that if the drought ends, water demand and supply may increase so marginal water supply may not be needed in 2016.

We acknowledge both the mandate to decrease water use by 20% by 2020 and the possibility that the drought may end. However, we do not know for certain when the current drought will end or another begin. We also recognize the current emergency conditions regarding water supply and conservation. Again, for purposes of a default in the face of current conditions precluding

[47] The phrase "resource balance year" comes from the energy realm: "[P]roposed avoided costs of energy and capacity are split into long and short-run costs, with the transition between long-and short-run costs occurring in the "resource balance year" (which is defined as the first year in which the capacity and energy markets will reflect the full cost of new plants)." (D.12-05-015, at 47.)

[48] SB 7X7 (2009).

much in the way of alternative supplies, 2016 is a reasonable choice for the resources balance year as water agencies and utilities are currently facing choices about where and how they will produce water supply.

As with most other aspects of the W-E calculator, users can override the default choice of resource balance year default to account for a particular water supplier's planning, resource, and other needs. Users need to go into the water tool, change the resource balance year and then copy the results of the water tool into the energy tool. Navigant's final report, at section 3.3.3, contains additional details on how users can update the avoided capacity cost with a new resource balance year. Simplifying the process for changing the resource balance year is a subject for consideration in future iterations of the W-E calculator.[49]

Decision Point 3: Degree of Geographic Granularity

Many variables are inherent in determining marginal water supplies at the regional level. This fact raises a fundamental question: what degree of certainty regarding energy intensity is necessary for energy savings to be identified.

Identifying marginal supplies for each of several thousand individual water retailers is impracticable. The PCG concluded, and the Commission agrees, that this level of detail is unnecessary for the analysis of water-saving options across the large service areas of the energy IOUs. At a much higher level of aggregation, the hydrologic and administrative regions of DWR and SWRCB could be considered. However, DWR and SWRCB regions offer an imperfect fit for marginal water supplies, as surface water hydrology fails to correlate with

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[49] *See* Section **Error! Reference source not found.**, below, for a fuller list of changes under consideration for future versions of the W-E calculator.

developed groundwater resources. Neither does hydrologic region correlate with water rights, management, governance, treatment, nor delivery.

Nonetheless, the W-E calculator defaults to DWR hydrologic regions for data on the energy intensity of the marginal water supply (averaged for each region). The determinative factor here was data availability. DWR data are available for all state regions and provided the necessary types and format of data. Other data sources that Navigant, the Commission, and the parties considered were not.

Accordingly, the tool adopts a default supply by DWR hydrologic region. The tool permits users to enter their own data, and share and store that data in place of any of the above-listed default values.

Decision Point 4: Capital Structure

The W-E calculator produces a net present value (NPV) for water and energy avoided costs. However, the W-E calculator itself does not explicitly make assumptions about capital structure; i.e., the discount rate used in the NPV calculation.

The W-E calculator receives values for avoided energy costs as inputs from the Avoided Cost Calculator. The cost of capital in the Avoided Cost Calculator is each energy IOU's weighted cost of capital. The avoided energy costs are derived from the NPV of the revenue required to be recovered to "pay off" the investment in the marginal energy assets.

Similarly, the W-E Calculator receives values for avoided water capacity costs as inputs from the water tool. The water tool includes assumptions about debt, equity and cost of capital. The avoided water capacity costs are derived from the NPV of the revenue required to be recovered to "pay off" the investment in the marginal water assets. The water tool uses a "fixed charge rate" calculation to determine the avoided cost.

UCAN takes issue with the use of IOU capital structure as the discount rate to calculate net present value for measure savings.[50] UCAN contends that the W-E calculator's use of a levelized "fixed charge rate," "overstates the annual value in the early years and understates the annual value in the later years."[51]

UCAN's concerns are generic to demand side avoided cost calculations. Whatever the merits of UCAN's concerns with the approach the Avoided Cost Calculator takes to discounting to NPV, we are not going to take such concerns up piecemeal.[52] The W-E calculator's approach is the same as that used in the Avoided Cost Calculator to calculate the NPV of benefits for each measure.[53] UCAN identifies no reason to use an alternative discount rate just for water-energy measures versus other energy efficiency measures, or versus demand-side management measures generally, and we see none.

Decision Point 5: Load Profile

There are two types of load profiles in the W-E calculator. The first is the load profile of hourly water system use:

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[50] UCAN June 10, 2015 comments, at 11-12.

[51] UCAN June 10, 2015 comments at 11.

[52] The Commission is examining its approach to all demand side cost-effectiveness methodologies in proceeding R.14-10-003, (Order Instituting Rulemaking to Create a Consistent Regulatory Framework for the Guidance, Planning, and Evaluation of Integrated Demand Side Resource Programs). UCAN's concerns with calculation of net present values for "demand-side resource(s) with much shorter lives and suffering from persistence problems" (UCAN June 10, 2015 comments, at 11) might be better raised there.

[53] Navigant Report, at 31.

> The Navigant team used the Water-Energy Load Profiling (WELP) Tool, as augmented by the Pacific Institute for the CPUC water-energy pilots, to develop an average 24-hour load profile representative of all water system components, as shown in Figure 7. This load profile represents actual energy consumption in 2008 from more than 30 water and wastewater utilities throughout California. This 24-hour profile is assumed to hold every day of the year. It was applied to the hourly avoided cost of electricity for IOUs before aggregating the avoided cost into a monthly stream of values for the Water Energy Calculator.[54]

This quote refers to 24-hour/8760 hours-per-year load profiles that are applied to the hourly avoided energy costs. Data for this type of load profile are not user editable in the tool. They were applied as a data pre-processing step outside the tool to cut down on file size and run time.

The other type of load profile is the monthly water conservation energy use profile. These profiles are specific to the conservation measure (i.e. toilets have constant year round savings while cooling towers and landscaping are seasonal). The W-E calculator permits users to enter their own data in place of any of the monthly water conservation load profile values. User-entered data may provide more contemporary and local data, allowing for more granular analysis of the embedded energy in water.

No party took issue with the tools' approach to load profiling. We find this approach to load profiling reasonable.

Decision Point 6: Non-IOU energy

For background:

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[54] Navigant Report, at 30.

> "The three largest statewide conveyance systems – the state owned and operated State Water Project (SWP), the federally owned and operated Central Valley Project (CVP), and the Colorado River Aqueduct (CRA) owned by MWD are designed as inter-basin transfer systems: their primary purpose is to redistribute water . . . The SWP and CVP redistribute California water supplies; CRA brings water supplies from the Colorado River to supplement supplies in . . . southern California."[55]

In 2005, a report from the California Energy Commission estimated that supplying *and heating* water consumed 19% of the electricity used in the state. As discussed above, Study 1 concluded that *supplying water alone* makes up 7.7% of statewide electricity use (19.3 TWh annually). California's long distance water conveyance systems, including the SWP, use approximately 4% of total statewide electricity. The SWP uses 60% of that total conveyance energy. Typically, wholesale energy markets, not IOUs, supply electricity for water conveyance. Conversely, energy used for other water supplies, including groundwater and local water resources, usually comes from IOUs.

We have before us the question of what to do about cold water conservation that saves both IOU and non-IOU embedded energy. Should we account for non-IOU energy savings when determining the cost-effectiveness of energy IOU programs? Should we consider GHG reduction benefits resulting from non-IOU energy savings, even if we are not including non-IOU energy savings? The question here is why should an energy utility's customers pay to benefit people who are not also that energy utility's customers? Does it benefit an SCE customer, for example, to save water and/or energy (and so money) and reduce GHG emissions for a customer of some other utility?

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55 PCG White Paper at 15.

Whether to credit Commission-jurisdictional PAs with reduced energy use by extra-jurisdictional utilities is not a new issue. It arose in the context of the 2008 water-energy pilots, after "PG&E and SCE [] commented on the fact that the calculator [under consideration in D.07-12-050] does not include any information on energy saved outside of the funding utility's service territory. SCE argues that this undervalues benefits and results in artificially low cost-effectiveness numbers." [56]

In this proceeding, SCE "recommends adding the dollar value of non-IOU avoided embedded energy costs to the environmental benefits calculated and to include this benefit in the Societal Cost Test."[57]

We will not adopt SCE's recommendation. We do not use a Societal Cost Test[58] in connection with energy efficiency. Non-jurisdictional utilities' avoided energy costs are not among the costs included in TRC. Consistent with long-standing policy, the W-E calculator correctly accounts only for IOU energy. Saved non-jurisdictional utilities' energy conveys benefits to a completely separate set of customers than IOU customers. Saving energy for such utilities is outside jurisdictional IOUs' remit. Commission-jurisdictional energy utilities should neither be tasked with nor credited for achieving energy savings for non-jurisdictional energy utilities.

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[56] D.07-12-050, at 40-41.

[57] SCE June 10, 2015 comments, at 3.

[58] "The societal cost test is a variation of the total resource cost test, which looks at costs and benefits from the perspective of society, not just the utility and its ratepayers. This variation includes the impact of externalities on costs and benefits, and treats tax credits and interest payments as transfers." (D. 92-02-075, at 113.)

4.2.1.3. Avoided Pre-Use Treatment Embedded Energy

We have largely focused so far on the cost for moving water from source to treatment point. We turn now to the energy used in treating water for consumption. The model defaults to the past CPUC embedded energy Studies 1 and 2 and other secondary studies and applies values from them to the DWR hydrologic regions. As described above, the W-E calculator uses DWR hydrologic regions because of concerns about the consistency and adequacy of alternative data sources. At this point, other data resources are patchy and not robust, so data averaged by hydrologic regions are currently the only practical choices for default values.

The tool permits users to enter their own data in place of the default data. It also permits that data to be stored and shared. The Commission hereby orders each Class A and each Class B water utility to provide Commission Staff with data about their respective energy intensity, formatted for use in the W-E calculator and water tool, within 90 days of the mailing date of this decision. Commission Staff will post these data to a Commission-maintained web site. As users enter their data, robust local sources of data will be created through a common data platform allowing for localized analysis. We note that in the energy field there is great interest in developing local data down to the circuit level or below, and many projects are underway to identify local data. As users enter data into the cost-calculator tool, the local energy intensity in water data will complement local energy analysis, and help target water, energy efficiency, and other measures.

4.2.1.4. Avoided Distribution Embedded Energy

Avoided distribution embedded energy is the energy that it takes to move water from point of treatment to point of consumption. The model defaults to the past CPUC embedded energy Studies 1 and 2 and other secondary studies and applies values from them to the DWR hydrologic regions. Again, this was a function of data adequacy, and is the practical choice for default values. The tool permits users to enter their own data in place of the default data. As described above, the local data will permit detailed analysis and local approaches to water, energy efficiency, and other measures.

4.2.1.5. Avoided Wastewater Treatment Embedded Energy

Avoided wastewater treatment embedded energy is the energy that it takes to move water from point of consumption through a wastewater treatment process:

> Wastewater treatment is classified as primary, secondary, or tertiary. Primary treatment refers to the use of physical barriers to remove solids, oil, and grease from the wastewater. Secondary treatment uses biological processes (e.g., aerobic stabilization ponds, activated sludge processes, and lagoons) to degrade the biological content of the wastewater. If receiving waters require that wastewater effluent contain particularly low nutrient content, or if the wastewater is going to be reused, it also undergoes tertiary treatment to reduce nitrogen, phosphorus, and other contaminant concentrations. Note that each successive treatment level is also subject to prior treatment levels (i.e., wastewater that undergoes secondary treatment must first be subject to primary treatment; wastewater that undergoes tertiary treatment was also subject to primary and secondary treatment).[59]

[59] Navigant Report, at 24.

"Wastewater systems energy intensity encompasses both treatment and collection pumps, as shown in Table 10:"[60]

Table 10.Total Electric Energy Intensity of Wastewater Systems (kWh/AF)

Technology	Energy Intensity (kWh/AF)
Primary + Secondary	344
Primary + Secondary + Tertiary	915
Wastewater Collection Pumps	74

Source: Navigant team analysis based on Study 2

The W-E calculator again defaults to values from the past CPUC embedded energy Studies 1 and 2 and other secondary studies and applies values from them to the Department of Water Resources hydrologic regions.[61] Once again, this was a function of data adequacy, and is the only practical choice for default values. The tool permits users to enter their own data in place of the default data. This is important as the embedded energy in wastewater conveyance and treatment may differ in local areas.

4.2.1.6. Integration of the W-E Calculator Outputs with the Cost Effectiveness Calculator

Once input values are in place (whether defaults or user-entered values), the W-E calculator provides embedded energy savings estimates in units of energy and dollars.

The W-E calculator also generates total resource cost (TRC) and program administrator cost (PAC) test results. We will discuss in detail how to allocate

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[60] Navigant Report, at 27-28.

[61] For wastewater energy intensity values by DWR hydrologic region, *see* Navigant Report, Table ES-2.

costs for purposes of energy utility TRC and PAC calculations in section[AB11] **Error! Reference source not found.**.

The mechanics for integrating W-E calculator output into the cost Effectiveness Calculator is something on which we do not yet have sufficient record. Some parties have suggested that we conduct additional workshops on integration mechanics. TURN has made some specific recommendations on integration.[62]

The Commission delegates to Commission Staff responsibility for integrating the W-E calculator and the Cost Effectiveness Calculator. To the extent that this requires consultant support, we authorize Commission Staff to retain such consultants and to fund such consultants from evaluation budgets. Funding for the evaluations will be proportional to program expenditures, as adopted in past energy efficiency decisions.

4.2.2. Energy IOU Cost-Effectiveness Values for Water-Energy Nexus Measures

PG&E requests that we approve the following program and measure impact values for water-energy projects:

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[62] TURN recommends the following remedies to address the current shortcomings of the model: Include embedded energy benefits in the existing E3 calculator. This would provide a transparent analysis of water-energy program benefits from an energy utility ratepayer perspective. And/or, expand the Navigant water-energy calculator to include site energy saving benefits, and run the calculator in two steps:

1. First with IOU site and embedded energy saving benefits; and

2. Next with water capacity and wastewater capacity benefits.

TURN June 10, 2015 comments, at 7-8.

- Locked in default net-to-gross (NTG) ratio[63] of .85; and,
- Available maximum expected useful life (EUL) of 30 years for removed equipment.

SDG&E and SoCal Gas echo the request for a locked-down net to gross ratio.[64] These are among the values we adopted for school measures in D.14-10-046 in response to Proposition 39.[65]

These values can incent PA investment in the affected measures by making those measures more attractive to PAs than they might otherwise be. The default NTG ratio makes programs more attractive to ratepayers and the IOU subset of PAs by improving the "net realization rate." This is one of the metrics we use to set shareholder incentive payments. Locked in NTG also improves apparent program cost-effectiveness. This is important for IOUs and community choice aggregators as they develop portfolios that meet or exceed the applicable cost-effectiveness threshold. Extending the EUL benefits a PA by providing a longer

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[63] "Net energy program impacts represent the amount of energy attributable to a program after adjustments for free-ridership. Gross energy program impacts represent the amount of change in energy consumption and/or demand that results directly from measures installed in the program without adjustments for attribution. NTG ratios refer to the ratio or percentage of net program impacts divided by gross or total impacts. NTG ratios are used to estimate and describe the free-riders that may be occurring within EE programs." (D.14-10-046, at 65 (internal citations omitted).

[64] Joint Utility June 10, 2015 comments, at 4.

[65] "Proposition 39 is the California Clean Energy Jobs Act. Approved by the electorate on the November 6, 2012 ballot, it provides some $550 million annually from the General Fund to the Clean Energy Job Creation Fund, (Job Creation Fund) for five fiscal years, 2013–2014 through 2017–2018." D.14-10-046, at 44.

stream of savings. It may also affect the time at which a code or standard practice baseline applies, and so affect the level of customer incentive offered.[66]

We will extend these values from schools to new water-saving measures added to energy efficiency portfolios in 2016 and after. The drought is a pressing concern. We do not wish to see delays in moving forward with adding new water-energy measures into the energy efficiency portfolios because of uncertainty about NTG ratios. Further, we recognize that much water infrastructure has expected useful lifespans well over 20 years, and so PAs ought to have the option to seek an EUL of up to 30 years for removed equipment.

PG&E also asked that the Commission prioritize water-energy projects "for ex post evaluation, assessing these projects on an annual basis."[67] We grant this request in light of Governor Brown's Executive Order and mandatory water conservation measures. While the drought may or may not ease in the future, water supply will continue to be a challenge in light of California's climate, economy, and projected population growth. Water is embedded in energy and ensuring that there is sufficient water supply for energy production is critical to reliability, safety, and just and reasonable energy rates. For these reasons we agree that annual ex post evaluation of water-energy projects will expedite analysis and learning about water-energy measures. As a result, evaluation of existing or new water-energy programs will be conducted by the Commission and included and prioritized in the next update to the energy efficiency master joint EM&V plan. Oversight and vetting of study plans and results will follow

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[66] *See* D.14-10-046, at 57 for a more extensive discussion of how EUL, and "dual baseline" affect savings accounting and justifiable incentive offers.

[67] PG&E June 10, 2015 comments, at 7.

the protocols articulated in the master EM&V plan. Funding for the evaluations will be proportional to program expenditures, as adopted in past energy efficiency decisions.

4.2.3. The Avoided Water Capacity Cost Model (Water Tool)

The Avoided Water Capacity Cost Model (water tool) uses capacity cost estimates for water avoided costs. Like its energy sibling, the water tool makes compromises around spatial and temporal resolution/granularity. The water tool simplifies where necessary to make the analysis tractable.

4.2.3.1. Inputs

The water tool considers the following types of avoided water costs:

- Avoided Water Supply Capacity;
- Avoided Treatment Capacity; and
- Avoided Wastewater Treatment Capacity.

For each of these, the default approach is the same as for the W-E calculator. We will not repeat the discussion of such default approaches here. Users can override default values for capacity costs as in the W-E calculator.

There is one area where there is potentially a material difference in inputs for the W-E calculator and for the water tool. That is for the commodity, as opposed to capacity, cost of water.

Commodity cost does not change the amount of energy embedded in water, though it may increase incentives to conserve water and thus embedded energy if increases in the commodity cost of water cause water rates to increase. The energy intensity of the long-run marginal water supply will not vary with commodity costs, which can fluctuate radically over the short run. Energy intensity might change in the short run as commodity cost changes drive users to change sources, but we lack evidence on how this variability would affect energy intensity. Moreover, as noted earlier, we are focused on the long run for purposes of the W-E calculator.

In addition, conserving water and thus energy in the short-run may delay or even forestall the need to invest in additional water or energy capacity in the long-run, and thus save ratepayers money. The CPUC conducts long-term forecasts for energy supply through various proceedings, and considers applications for new capacity in energy and water General Rate Cases (GRCs). Avoiding or delaying the need to plan, evaluate, approve or disapprove, permit, and build additional energy or water capacity by increasing conservation can save money and reduce the GHG, land, water, wildlife, community, and other impacts of new capacity resources.

Commodity cost is, however, of potentially great significance when it comes to valuing the avoided cost of water. A water agency that considers commodity costs of hundreds or thousands of dollars per acre foot even for a short time will see a very different cost effectiveness result than if that agency looked at capacity cost alone. Accordingly, the W-E calculator allows for consideration of commodity cost when calculating savings benefits for the water agency. Users seeking to use this feature must input their estimated future commodity costs into the W-E calculator, which uses the data to calculate benefits from water conservation measures.

At the February 11, 2015 All-Party Workshop, some of the parties representing water utilities discussed the volatility and tremendous increase in capacity costs during the drought since 2012. Mr. Jack Hawks from the California Water Association reported that whereas an acre-foot of water (enough water to cover an acre to the depth of one foot) could be purchased for $250 in 2012, by the end of summer 2014, the market price of an acre-foot was

$2,200. Mr. Hawks reported that water purchasers had already paid more than $1,000 per acre foot in 2015, and that the market price was expected to exceed more than $2,500 in summer 2015.

If the drought becomes more severe or continues into 2016, the commodity cost of water may rise reflecting the scarcity price of water. Accounting for commodity costs will help determine if measures to save water, and thus embedded energy, are prudent in light of market conditions that reflect water availability and price.

4.2.3.2. Outputs

The primary output of the water tool is the annual avoided cost of capacity. This is the level annualized payment that is required for an additional unit of capacity. The model also calculates the NPV of installed capacity. That is the value of future cash flows required to finance and operate a facility, discounted at the weighted average cost of capital.

The key point is that water tool outputs are inputs to the W-E calculator.

4.3. What Use of the Tools Will We Direct and/or Allow?

4.3.1. Use by Jurisdictional Water Utilities

Commission-jurisdictional water utilities may use the tools in connection with requests for ratepayer funding for any water saving measures/programs. The tools should facilitate water savings, and facilitate partnerships between energy and water utilities to advance water savings efforts.

We are not mandating that jurisdictional water utilities undertake any particular water saving measures/programs. The tools and this decision:

- **Do not** require water utilities to change their water supply planning decisions;
- **Do not** require water utilities to fund water efficiency programs ;

- **<u>Do not</u>** require water utilities to use the tools for non-water-energy nexus measures and programs;
- **<u>Do not</u>** require water utilities to report their energy use;
- **<u>Do not</u>** dictate any goal or mandate for the level of funding, water savings, or energy savings for joint water energy programs from either energy or water utilities; and
- **<u>Do not</u>** consider avoided commodity cost of water as a default value (although they allow users to input water commodity costs).

4.3.2. Use by Jurisdictional Energy Utilities

PG&E asks the Commission to "provide explicit guidance on when, how, and to what extent users should modify default assumptions for custom projects."[68]

The Commission requires that Commission-jurisdictional energy utilities use the tools in preparing their requests for ratepayer funding for measures/programs that reduce water use and thus save embedded energy. The Commission adopts a rebuttable presumption that use of the tool with defaults to generate inputs to the Cost Effectiveness Calculator is reasonable for purposes of gauging measure/program cost effectiveness, and for purposes of estimating the economic value of energy savings from measures/programs with a cold-water savings component.

This does not preclude PAs from using alternatives to the defaults. As PG&E notes, "In some cases, agency-specific energy intensity data will be available and suitable for use in custom projects with proper documentation and standards (which raises a number of questions about length of baseline period,

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[68] PG&E June 10, 2015 comments, at 3.

how to account for varying sources of supply that may not have intensity data available, and how to account for locational factors such as site elevation). User-specified input values would be documented and evaluated through normal calculated project review mechanisms."[69] PAs may depart from defaults where the tools allow, as discussed above. Where PAs depart from default values, they will bear the burden of proving the departures reasonable in all documents submitted to Commission Staff, per existing rules. Our goal in allowing departure from defaults here is to facilitate energy IOUs seeking out high energy intensity, high water use, areas. Targeting such areas should maximize energy savings per dollar spent on water saving measures.

Several parties commented at workshops on the potential difficulty associated with *energy* IOUs validating (and Commission Energy Division Staff reviewing) *water* savings claims, and *water* utility energy intensity data. To move review forward, energy IOUs should partner with water agencies to be sure requests for departures from defaults as well as claimed water savings are well-documented ex ante, using best available information.

The timing and mechanics for reviewing energy efficiency programs is at issue in Phase II of R.13-11-005. The generic rules that emerge from that proceeding will apply to review of water energy projects/programs except as noted herein. Pending further direction in R.13-11-005, PAs may proceed with water-energy measures/programs under existing rules.

Energy IOUs may use the cost-calculator tool to consider what may be characterized as "consumer" measures to save water and thus embedded energy,

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[69] PG&E June 10, 2015 comments, at 3.

such as toilet repair or replacement, and cold or hot water measures inside a customer's premises. Energy IOUs may also use the cost-calculator tool to consider partnership opportunities with water utilities.

For example, the cost-calculator tool could be used to analyze the energy savings associated with allowing water utilities to use the energy IOUs' smart meter network including, but not limited to, data collectors, to allow advanced water meter deployment and reading. CWA recommends "that the Commission adopt a partnership program where the water companies would be permitted, in appropriate circumstances, to utilize the existing energy IOUs' AMI backbone. CWA believes that the water savings associated with the AMI installations will result in energy savings and, accordingly, that the energy IOUs should receive credit for such energy savings for partnering with the water companies."[70]

The W-E calculator could be used to analyze whether a wholesale measure such as water utility access to the energy utility AMI backbone will save water and thus embedded energy. We do not prejudge the cost-effectiveness of such measures, we only state that the Energy and Water IOUs may use the cost-effectiveness tool to evaluate a range of measures and determine if they fit within the parameters for the relevant program.

While the Commission has approved deployment of smart electricity and gas meters,[71] the Commission has not approved smart meters for Commission-jurisdictional water IOUs. Water smart meters may offer significant water (and so energy) savings by, among other things, providing real-time feedback on

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[70] CWA June 10, 2015 Comments, at 10 and 11.

[71] *See*, *e.g.*, D.10-04-027 (Decision on Application of Southern California Gas Company for Approval of Advanced Metering Infrastructure).

water use. A smart meter can, under some circumstances, indicate immediately if there is a leak at a customer premises. In contrast, traditional billing systems may take weeks or months to provide evidence of a leak. CWA asks that:

> the Commission add the approval of advanced metering infrastructure (AMI) installations to the scope of the water-energy nexus proceeding because, as a result of the Governor's mandate to reduce statewide water consumption by 25 percent and the accompanying State Water Resources Control Board's (State Board) promulgation of emergency regulations requiring per-utility conservation targets, there is an immediate need to provide customers with real-time information on their water consumption, which in turn the has created an accompanying potential for water and related energy savings. [72]

The issue of AMI infrastructure for Water IOUs will be considered later in this proceeding. The Commission's Resolution implementing Governor Brown's April 1, 2015 Executive Order to address the drought authorized water IOUs to consider and propose "bold measures" including making available advanced water meters to customers at the customers' cost to communicate information to manage customer use of water and energy.[73] The Commission will consider proposals in the Water IOUs' Advice Letters to implement Resolution W-5034. Water IOUs may propose additional measures through the Advice Letter process to address the goals of the Commission's Resolution and the Governor's Executive Order.

In the meantime, we direct the energy IOUs and California Water Association to work together with Commission Staff through an ideation

[72] CWA June 10, 2015 Comments, at pg 2.

[73] {Resolution}.

process[74] and to file one or more pilots on AMI integration within 90 days of the mailing date of this decision. We will then put the proposal out for public comment and conduct a workshop on the proposal. The goal for the pilot(s) will be identifying technical issues with a third party "piggybacking" on energy IOU AMI infrastructure. Regarding funding for work on the pilots, see section **Error! Reference source not found.**[AB12][75] below.

4.4. Cost Allocation

4.4.1. Cost Effectiveness Results

For energy efficiency portfolios, as for any other investment, we conclude that it is worthwhile (i.e., cost effective) to invest funds if, over the lifetime of the portfolio, the benefits exceed the costs. As discussed above, the Cost Effectiveness Calculator provides results in the form of benefit-cost ratios for each measure/program.

4.4.2. Energy Efficiency Cost Effectiveness Tests

In the energy efficiency realm, we consider two metrics for gauging cost effectiveness: the Total Resource Cost Test (TRC) and the Program Administrator Cost Test (PAC).[76]

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[74] The Ideation Process is an informal process developed jointly by Commission staff and IOUs to facilitate development and reporting of new projects.

[75] "Funding of Water-Energy Nexus Programs Between Energy Efficiency Portfolio Cycles and Water General Rate Cases"

[76] The Standard Practice Manual that has been adopted by the CPUC to determine the cost-effectiveness of demand-side programs identifies four tests which measure cost-effectiveness from different perspectives: the TRC, PAC, Ratepayer Impact Measure (RIM), and Participant Cost Test (PCT). As discussed further below, the TRC and PAC are the significant ones for purposes of this discussion.

- The TRC measures the costs and benefits from the combined perspective of the program administrator (usually a utility) and the program participant, who are jointly investing in efficiency. As such, it includes both utility and participant costs and benefits. Rebates are not included in the TRC calculation because they are a *cost* to the utility and a *benefit* to the participant, and therefore cancel out. In sum, the TRC "quantifies the costs and creates a ratio of all the costs and the benefits of the energy efficiency portfolio as compared to the supply-side resource. The results provide an estimate of cost-effectiveness recognizing the avoided costs of comparable supply-side investments;"[77] The TRC *includes* all incremental measure costs (IMC), including costs that a program participant pays, *except for* the rebates/incentives that a PA pays.[78]
- The PAC measures the costs and benefits from the perspective of the program administrator (usually a utility) who is managing the program. It does not include any costs and benefits related to the participant. That is, it "*include[s]* only the net present value of all costs incurred by the program administrator while *excluding* the costs incurred by the participating customers."[79]
- Administrative costs appear in both the TRC and the PAC calculations. Rebate costs appear only in the PAC and not the TRC calculation. Benefits (i.e., avoided costs) are the same in both tests. In sum, the elements of TRC and PAC break down as follows:

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[77] D. 09-05-037, at 51.

[78] Rebates are a subset of administrative costs for purposes of the Cost Effectiveness Calculator, so are subtracted from the TRC calculation to avoid double-counting. (*See* Energy Efficiency Policy Manual, v.7, at 17, n.37.)

[79] Energy Efficiency Policy Manual, v.7, at 17 (emphasis added).

Cost	TRC	PAC
Incremental equipment costs paid by customer	X	
Admin	X	X
Rebate		X
Customer net installation cost	X	
Utility net installation cost	X	X

PAC tends to be higher than TRC, since it uses the same benefits but generally has lower costs compared to the TRC, since the net participant costs are not included. A pair of simple examples illustrates the differences between the tests.

Consider a hypothetical measure, with an IMC of $10.00. In example one, there is a $1.00 utility rebate, a $1.00/unit administrative cost. In example two, the utility rebates the full $10.00 incremental measure cost. Administrative cost is still $1.00.

The TRC costs are the full societal costs of the measures – incremental measure cost plus utility administration costs. These costs equal the IMC plus administrative costs. This works out to $11 in both examples. The PAC costs are the admin cost plus the rebate cost.

We will assume a $10 benefit, in the form of avoided cost, in both examples.

From the inputs in these examples, we can derive TRC and PAC values as follows:

Ex.	IMC	Rebate Cost	Admin Cost	Avoided Cost	TRC benefit cost ratio = Benefits/(IMC + Admin)	PAC benefit cost ratio = Benefits/(Rebate+ Admin)
One	10	1	1	10	=10/11=.91	= 10/2=5.0
Two	10	10	1	10	=10/11=.91	=10/11=.91

For all demand-side programs, we require PAs to calculate both the TRC and the PAC. Both must be above 1.0.[80] The TRC generally ends up as the controlling number when we are evaluating portfolio cost effectiveness.[81] The PAC generally results in a higher (i.e., better) benefit/cost ratio than the TRC because the PAC test excludes the costs of the participant, and the participant's costs are generally a large portion of the IMC.

To integrate W-E calculator outputs with the Cost Effectiveness Calculator, we have to decide how to allocate water-energy nexus program costs and savings between contributing energy and water utilities. Without knowing what costs to consider, PAs (and we) cannot derive cost-effectiveness estimates specific to the energy or water utility. One can calculate a *combined* utility TRC including all the costs and all the benefits to both in one equation, but that is not what we need for purposes of evaluating cost effectiveness separately for each utility.

In sum, for the W-E calculator to be useful in its intended role, we must provide guidance on which costs and benefits PAs are to include in calculating PACs and TRCs for water-energy nexus. Related but distinct questions are: (a) how cost effectiveness information should guide energy utility participation

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[80] As discussed in D.14-10-046, we have historically required TRC ratios in excess of 1.25. for 2015, we accepted portfolio TRCs of 1.0.

[81] D.14-01-033, at 40; D.09-05-037, at 53.

in water-energy nexus programs, and (b) whether to restrict energy utility spending on water-energy nexus programs through the imposition of spending ceilings and/or a "standalone" [82] cost-effectiveness requirement. MWD asks "the Commission to indicate that: (1) the Embedded Energy Calculator and Avoided Cost Model are not intended for setting water agency conservation incentive levels or allocating costs between water and energy agencies; and (2) it would be inappropriate to use them for those purposes." We decline this request.

A primary purpose of this rulemaking is to "to explore . . . . how the costs of [water-energy] programs should be allocated among participants."[83] Commission-jurisdictional utilities will use the tools to evaluate measures that address the water-energy nexus, and their fit to various programs. The Commission will use the tools in reviewing proposed spending by Commission-jurisdictional entities on water-energy activities, and expenditures within existing program guidelines.

We are not being prescriptive about how tool outputs relate to Commission-jurisdictional utility spending decisions. Further, we cannot compel spending by non-Commission-jurisdictional entities such as MWD.[84] Whether other entities adopt and use the tool such as the State Water Resources Control Board (SWRCB), DWR, or municipal water suppliers or utilities is up to

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[82] "'Stand-alone' in the context of cost-effectiveness refers to determining the cost-effectiveness of an individual energy efficiency measure without regard to other measures or the overall utility energy efficiency portfolio." (D.09-12-022, at 1, n. 1.)

[83] R.13-12-011, at 2.

[84] We might condition jurisdictional entity spending on non-jurisdictional entities' also providing funding for something. But we cannot and do not compel spending by non-jurisdictional entities.

those bodies to determine. We encourage use of the tool by a variety of entities, and the tool is designed to share data and provide a common platform for analysis and learning.

4.4.3. Whose Costs, and Whose Benefits?

The discussion so far has dealt with a single-utility scenario. Matters become more complicated when costs and benefits of more than one utility are involved in promoting and implementing a measure or program. Intersection of two utility "societies" (water and energy utilities; single-commodity energy and gas utilities) creates "seams," and silo, proceeding, and jurisdictional challenges.

As noted earlier, in a single-IOU energy utility scenario we generally determine cost-effectiveness for the Energy Efficiency program using the TRC. We require use of full incremental measure cost for the Energy Efficiency program TRC calculation. In a single-utility scenario, it is simple enough to assign all incremental measure costs to the one utility.

Introducing another utility into the evaluation of a measure's costs and benefits requires determining which utility bears what amount of a program's cost. Similarly, benefits must be allocated in a multi-utility scenario. Determining cost/benefit allocation is a "critical question:"[85] As the Commission asked back in 2007, "Even if a measurable amount of energy is saved, do the benefits of the reduced energy consumption flow to the utility customers that are paying for the water conservation program?"[86] This question applies equally to energy efficiency programs.

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[85] D.07-12-050, at 32.

[86] D.07-12-050, at 32.

At the cost allocation workshop, PG&E gave the example of how different allocation methodologies might affect the cost-effectiveness calculations of a toilet replacement. In the example, both a water and an energy utility participate in the program.

Note that the cost and savings numbers in the example are merely illustrative.[87] What matters for purposes of discussion here is how the cost-effectiveness numbers change relative to one another under different approaches to calculating cost effectiveness.

Here is the example:

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[87] *See* Navigant Report, at 48:

Annual Water Savings

- CPUC water-energy pilots estimated toilet water savings of 4,800 – 10, 600 gallons per year.
- An EPA WaterSense high-efficiency toilet uses 1.28 gallons per flush and can save more than 8,000 gallons per year.
- We assume the reasonable range of water savings to be 5,000 – 8,000 gallons per year
- Water capacity savings thus ranges from (13.7 to 21.9 gallons/day)

Costs

- A variety of WaterSense labeled toilets at different price points are available on the market. Prices range from $150 to $1,500. Price can vary by design, color, and toilet features. We assume the reasonable price range is $200 - $275.
- We assume a $100 rebate, a program administrative cost of $75 per toilet (75% of incentive costs), and an installation cost of $150. Combined with the cost of the toilet, the total installed cost including program administration ranges from $425 – $500.
- All input costs are assumed to be the nominal cost of equipment and services in the year of installation.

Measure Life

- We use the range of observed EULs (20-25 years) in our analysis (*see* Table 23).

Hypothetical Toilet Replacement Program

Cost effectiveness methodology for a hypothetical water efficient toilet program

	Savings	Benefits	Incremental Cost	Program Costs	Combined TRC	Combined PAC
Energy Utility	0 kWh (direct) 103 kWh (embedded)	$113	$450	$250 incentive $50 admin	2.07	3.46
Water Agency	13,000 gallons	$116 (water) $808 (WW)				

Water: $200 Incentive, $40 Admin

Energy: $50 Incentive, $10 Admin

Allocate Full IMC to Energy Efficiency

	IMC	TRC	PAC
Energy Utility	$450	0.25	1.88
Water System	$0	23.09	3.85

Split IMC 50-50

	IMC	TRC	PAC
Energy Utility	$225	0.48	1.88
Water System	$225	3.49	3.85

Split IMC in Proportion to Benefits

	IMC	TRC	PAC
Energy Utility	$49	1.91	1.88
Water System	$401	2.09	3.85

Split IMC in Proportion to Program or Incentive Cost

	IMC	TRC	PAC
Energy Utility	$90	1.13	1.88
Water System	$360	2.31	3.85

Note: Illustrative estimates for representative assumptions using Navigant water/energy calculator.

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To summarize, the hypothetical toilet will cost $450. The IMC is also the full measure cost of $450. This case involves replacing a working unit with considerable remaining useful life in order to save water, and thus embedded energy that would continue throughout that unit's remaining useful life.

4.4.3.1. The TRC Equation

As a general proposition:

Electric TRC = value of embedded energy in water/(electric admin + (*e*)participant incremental costs assigned to energy benefit))

Water TRC = value of water savings/(water admin + (1-*e*) (participant incremental costs)).

4.4.3.2. What Percentage of Costs Should We Allocate to Energy and Water Utilities, Respectively?

The denominator in each formula above represents the costs to the electric and water utilities and their customers, respectively. The first term is each utility's costs. The last term is the part of the participant costs attributed to the electric and water components, respectively.

The key variable is what we have dubbed *e.* It is the percentage of participant costs that we allocate to the energy utility. The question on the cost side is: how do we set the value of *e*?

PG&E proposed four allocation alternatives for consideration. (1) Allocate full IMC to the energy utility. (2) Split the IMC 50/50 between the energy and water utilities. (3) Split the IMC in proportion to benefits. (4) Split the IMC in proportion to Program or incentive cost based on the ratio of energy benefits (calculated using the W-E calculator) to water benefits (calculated using the water too). Several commenters proposed a fifth alternative: (5) using the PAC exclusively, which would exclude consideration of any costs borne by the customer.

We will set *e* in proportion to the benefits that energy and water utilities each receive from a measure/program. Working from the toilet example, it is reasonable to assume that the participants are purchasing a low flow toilet because of the benefits they will receive in the form of lower water bills, and to help out with the drought. They are unlikely to be incurring this cost because of a future, hypothetical, reduction in their electric bill as a result of a decrease in the embedded energy in the water they use, even if the program materials explain this benefit. The relative benefits of the hypothetical toilet program above reflect this disparity, as they run 9:1 in favor of the water utility.[88]

The value of *e* in this case in this example would be .11.

We decline to adopt the PAC for cross-utility allocation purposes. The PAC does not account for participant costs at all. The PAC thus does not take account of what may well be (as in the preceding example) most of the costs of a measure or program.

4.4.3.3. What Water Savings Should We Credit to Energy and Water Utilities, Respectively?

On the *savings* side, the question is, should we credit the energy utility with the embedded energy savings of all the water the measure saves? Returning to the toilet example discussed at the cost allocation workshop, the W-E calculator calculates savings as the net present value of:

*energy intensity * gallons saved over the life of the toilet * avoided cost of energy*

Remember, the energy utility only paid for a fraction of the IMC. So we have to ask whether it is reasonable in that case to credit the energy utility for *all* of the savings associated with that measure. SCE proposed crediting the energy utility with only a portion of the gallons saved. PG&E proposed crediting the energy utility with all the gallons saved.

For the numerators in each equation, we will allocate to the electric utility the value of the embedded electricity in all water saved. Likewise, for the water utility we will allocate the water capacity and commodity value (if any) of all the water saved. The energy utility values avoided embedded energy costs. The

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[88] In the example, water agency benefits are $924. Energy benefits are $113.

water utility values avoided water costs. There is no point to allocating avoided embedded energy savings to a water utility. Likewise, an energy utility sees no value from avoided water commodity costs.

4.4.4. Energy Utility Spending and Budget Limitations for Water Energy Measures and Programs

In evaluating energy efficiency programs, we do not generally require individual energy efficiency measures, or even programs, to be cost-effective. Instead, we require that a PA's energy efficiency spending "be cost-effective as a whole portfolio, in which the cost of measures with a low TRC is offset in the portfolio by the higher savings of measures with high TRC."[89] Gauging cost-effectiveness at the portfolio level rather than at the measure or program level gives PAs flexibility in their program offerings. "Activities that are less cost effective can be offset by activities that are more cost-effective, so that the expenditure of ratepayer funds is cost-effective overall, without preventing certain market transformational or other experimental approaches that may lead to cost-effective activities in the long run."[90]

We have created limited exceptions to the general rule of gauging cost-effectiveness at the portfolio level, however. For instance, in D.09-12-022, we required that "new stand-alone solar-powered technologies must be cost-effective on a stand-alone basis."[91] At issue here is the limited question whether we should adopt a similar rule for just water-energy. As PG&E notes, "Some

[89] D.14-10-046, at 24.

[90] D.12-11-015, at 26.

[91] D.09-12-022, at 8.

have suggested that every [water-energy] partnership should be cost-effective."[92] UCAN, for instance advocates at length for a requirement that individual water-energy programs, or even individual measures, be cost effective to qualify for funding.[93] ORA, among others, calls for caps on the absolute level of dollars a PA may devote to water-energy programs.

The ultimate brake on excessive energy utility contribution to water programs is energy efficiency portfolio TRC. As we observed in D.14-10-046, and as TURN noted at the final workshop in this proceeding, energy efficiency portfolio TRCs are on a glide slope to minimum acceptable cost effectiveness levels. Energy utilities can ill-afford further expenditures on programs that further reduce portfolio cost effectiveness. That constrains their ability to funnel large amounts of energy efficiency money into water-energy nexus measures and programs that are not cost effective.

We decline to adopt any requirements that individual water-energy measures or programs be cost-effective, or to set specific limits on spending on water-energy programs. We see no reason to single water-energy measures out from among a raft of programs and/or measures that are or might not be cost-effective on their own. PAs will have discretion to adjust their energy efficiency portfolio as needed to hit the portfolio cost-effectiveness obligation. If a water-

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[92] PG&E June 10, 2015 comments, at 4 (citing to an ORA Mary 4, 2015 workshop presentation).

[93] UCAN's arguments in particular take on the energy efficiency portfolio approach to cost-effectiveness generically. Such a challenge is out of scope for this proceeding. It is in the preliminary scope for Phase III of R.13-11-005 regarding the Energy Efficiency program.

energy measure or program is not cost-effective, it will be up to the PA to compensate elsewhere in the portfolio.[94]

We note that IOUs may elect to use the tools approved here in the Energy Savings Assistance Program or areas where we do not require that programs or measures be cost effective. Use of the tools does not change program guidelines.

4.4.5. Funding of Water-Energy Nexus Programs Between Energy Efficiency Portfolio Cycles and Water General Rate Case

4.4.5.1. Energy Utilities

We are not mandating here any spending by any Commission-jurisdictional (or non-jurisdictional) entity. Commission-jurisdictional energy utilities will have to obtain authorization for spending pursuant to current budget rules and process, and to the superseding procedures that emerge from Phase II of R.13-11-005. Energy efficiency Program Administrators may use the tools in connection with any cost-effectiveness showing they are obliged to make under existing program/portfolio review process. In light of the drought and Governor Brown's April 1, 2015 Executive Order, we will allow Commission-jurisdictional utilities to use the tools to evaluate measures they could take within existing program authority to address the water-energy nexus and the drought.

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[94] We address here concerns such as those raised by PG&E about the need for flexibility around rebate design, and sharing (or not) of administrative costs. (*See* PG&E June 10, 2015 comments, at 5.)

4.4.5.2. Water Utilities

Water utilities have expressed concern about their ability to fund water-energy nexus measures without waiting for their next General Rate Case (GRC). They have asked for a mechanism for cost recovery in the interim. For example, "In light of the emergency nature of the drought and the need for immediate action, CWA recommends that the Commission adopt a Tier 2 Advice Letter process to permit water companies to seek approval of water-energy nexus projects and programs between GRCs"which last three years. The Irvine Ranch Water District similarly recommended that the Commission authorize "an Advice Letter mechanism in the near term to allow for joint water and energy investment in water conservation projects and programs arising in response to the drought and the unprecedented state mandate for water conservation."[95]

Water IOUs have submitted Advice Letters to implement their action plan to respond to the CPUC's Resolution implementing Governor Brown's April 1, 2015 Executive Order to reduce water usage. Commission evaluation of those Advice Letters is pending. The cost-calculator tool could be used to modify the Advice Letters or submit new Advice Letters if warranted to comply with the CPUC's 2015 Resolution. The cost-calculator tool may also be used in Water IOU GRC Applications, and may be relevant to the CPUC's Balanced Rates OIR R.11-11-008.

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[95] Irvine Ranch Water District Comments on the Navigant Report, Cost-Calculator Tool, and Cost-Sharing, pg. 6.

The Commission approved water-energy savings programs in D.10-04-030 and in W-4854. In both cases, the water utilities were authorized memorandum accounts to book costs for future recovery by Tier 3 advice letter or through the utility's next rate case. We recognized these projects as pilots outside of the scope of the expenses covered by the GRC.

This decision grants water IOUs authority to establish memorandum accounts to track expenses for water-energy nexus projects (Water-Energy Nexus Memorandum Accounts). Water IOUs may seek recovery of expenses booked to these memorandum accounts through a Tier 3 advice letter, or in their next respective general rate case filing. Water IOUs may affirmatively establish such memorandum accounts by listing such accounts on their Preliminary Statement contained in their tariff book through a Tier 1 advice letter filing. Water IOUs may use the W-E Cost-Calculator to evaluate and propose measures that save water and embedded energy in a cost-effective manner.

4.5. Future Evolution of the Tool

4.4.1. Process

PG&E asks us to "affirm that current avoided cost practices will be followed for the water-energy calculators, with updates applied prospectively on an ex-ante basis and that calculator values will be "locked down" until such an update occurs."[96]

SCE proposes periodic updates to the tools.

We do not want default values to become stale, certainly, but we will not prescribe any update schedule for the tool here. Presently it is unclear when changes will happen, who will make them, and who will fund them. See the

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[96] PG&E June 10, 2015 comments, at 4.

preceding and following subsections of this decision for discussion of those issues. With these issues in flux it is premature and unnecessary to establish "lockdown" rules.

We recognize that the tools draw inputs from other sources (e.g., the Avoided Cost Calculator). We decline to adopt here any lockdown rules for those other sources that would be unique to water-energy nexus measures.

4.4.2. Substantive Changes

The most pressing substantive change we would like to see for the tools is the addition of default gas energy intensity values to the W-E calculator. When the W-E tool is run with default settings, no gas savings or benefits appear (if users type in gas EI values the tool will value them). Water pumps can be gas-powered, as can components of water and wastewater treatment facilities. Failing to credit gas savings to cold-water saving measures may cost opportunities for collaboration between gas providers and water utilities. It may also reduce the benefit of the tools for water-saving programs or measures that already provide a site-specific gas savings.

Other changes we would like to see eventually are:

- Menu available to show inputs for water agencies that provide it;
- Any differences associated with tribal water rights;
- GIS overlay of IOU service territories and hydrologic regions ;
- Data on commodity costs;
- Make the model more user friendly - eliminate any two stage calculation with multiple models;
- Additional analysis on the resource balance year;
- Update all default input values to reflect ongoing changes and/or when better data become available;

- Format outputs or build an export function to allow easy integration of results with the existing CPUC cost effectiveness tool;
- Easier way to change resource balance year, and to have the marginal resource type change in future years;
- Calculate total energy savings dollar value, including non-IOU energy value and the associated GHG impacts; and
- Where to host the tools;
- Additional user support.

This list is aspirational, and inclusive but not limiting. The list will evolve as users gain experience with the tool, as we discuss next.

5. Conclusion

As stated at the outset, the Commission is pleased with the degree of consensus that parties have reached over the tools. Various parties propose changes around the tools' edges, and also limitations to the tools' uses. Overall, however, there is unanimity that the tools offer a real advancement in measuring the costs that cold-water saving measures avoid. The tools will enable the Commission to recognize the energy value of such measures, and will support energy utility, water utility, Commission, and community exploration of such measures.

Finally, the tools provide a relatively simple, transparent set of calculations, and rely on no proprietary data or software. The tools enable user input, creating a sharable data bank that reflects local conditions. Use of this tool and sharing of user-input data will materially advance our understanding of the energy intensity of water at a local level. This will enable new evaluation, new thinking, new programs, and new opportunities.

We concur with the parties that we should continue to refine the tools. We are adopting the tools as they are to promote cost-effective water-saving measure development in 2016 and beyond.

6. Categorization and Need for Hearing

We affirm the scoping memorandum's characterization of the proceeding as quasi-legislative, and the scoping memorandum's determination that no hearings are required.

7. Comments on Proposed Decision

The proposed decision of Commissioner Sandoval in this matter was mailed to the parties in accordance with Section 311 of the Public Utilities Code and comments were allowed under Rule 14.3 of the Commission's Rules of Practice and Procedure. Comments were filed on ________________, and reply comments were filed on ________________ by __________________.

8. Assignment of Proceeding

Catherine J.K. Sandoval is the assigned Commissioner and Todd O. Edmister is the assigned Administrative Law Judge in this proceeding.

Findings of Fact

1. It takes energy to produce, deliver, and dispose of potable water. It can take energy to push or pull the water from the place where nature produces it to the place where it is needed. It often takes energy to move the water to storage or to deliver it to a customer. It takes energy to clean the water again after it becomes waste and before it can be released to the greater environment.

2. Reducing cold-water use can save energy.

3. Factoring cold-water energy savings into energy efficiency program development and evaluation requires quantifying how much energy it takes to move and treat cold water – so-called embedded energy.

4. The Commission's currently-approved tools for measuring the cost-effectiveness of energy efficiency programs do not account for the embedded energy benefits of water savings. Without tools such as those under evaluation in this proceeding, the Commission has lacked a way to quantify any energy savings associated with reductions in cold-water use.

5. The new energy and water tools will enable estimation of the IOU and non-IOU embedded energy savings that result from joint water-energy programs.

6. The new energy and water tools will enable assessment of the benefits that accrue to energy utilities and to water utilities from programs and measures that save both energy and water.

7. As a practical matter we cannot develop default values for the tools that will work for the thousands of water suppliers in energy utility service territories. We have to simplify to make the default analysis tractable.

8. There are significant differences on a sub-regional scale in terms of average water supply due to:

- Historical water rights;
- Development history; and
- Local geography/water resources.

9. Marginal avoided water supplies have reasonable uniformity on a regional basis.

10. A marginal supply is "on the margin," meaning that the "next" available supply when demand increases.

11. Data on short-run water supplies is hard to come by.

12. Transporting water from outlying sources may involve much energy that is not from Commission-jurisdictional energy companies.

13. Short-run water supply options can vary enormously in cost from period to period, and from place to place.

14. The cost of capital in the Avoided Cost Calculator is each energy IOU's weighted cost of capital. The avoided energy costs are derived from the NPV of the revenue required to be recovered to "pay off" the investment in the marginal energy assets.

15. The W-E Calculator receives values for avoided water capacity costs as inputs from the water tool.

16. The water tool includes assumptions about debt, equity and cost of capital. The avoided water capacity costs are derived from the NPV of the revenue required to be recovered to "pay off" the investment in the marginal water assets. The water tool uses a "fixed charge rate" calculation to determine the avoided cost.

17. There are two types of load profiles in the W-E calculator. The first is the load profile of hourly water system use. These load profiles are not user editable in the tool. The other type of load profile is the monthly water conservation energy use profile. This latter type of profile is specific to the conservation measure (i.e. toilets have constant year round savings while cooling towers and landscaping are seasonal) The W-E calculator permits users to enter their own data in place of any of monthly water conservation load profile values.

18. Typically, wholesale energy markets, not IOUs, supply electricity for water conveyance. Conversely, energy used for other water supplies, including groundwater and local water resources, usually comes from IOUs.

19. We do not use a Societal Cost Test in connection with energy efficiency. Non-jurisdictional utilities' avoided energy costs are not among the costs included in TRC. Consistent with long-standing policy, the W-E calculator

correctly accounts only for IOU energy. Saved non-jurisdictional utilities' energy conveys benefits to a completely separate set of customers than IOU customers.

20. Data resources on the energy intensity of pre-use treatment organized other than by DWR hydrologic region are patchy and not robust. Hydrologic regions are currently the only practical choices for default values.

21. Avoided distribution embedded energy is the energy that it takes to move water from point of treatment to point of consumption. Avoided wastewater conveyance treatment embedded energy is the energy that it takes to move water from point of consumption through a wastewater treatment process.

22. Data from CPUC embedded energy Studies 1 and 2 and other secondary studies and applies averaged by DWR hydrologic region are the practical choice for default values for avoided distribution embedded energy and avoided wastewater conveyance treatment embedded energy.

23. The default NTG ratio makes programs more attractive to ratepayers and the IOU subset of PAs by improving the "net realization rate."

24. Extending the EUL benefits a PA by providing a longer stream of savings.

25. Extending the EUL may also affect the time at which a code or standard practice baseline applies, and so affect the level of customer incentive offered.

26. The drought is a pressing concern. We do not wish to see delays in moving forward with adding new water energy measures into the energy efficiency portfolios because of uncertainty about NTG ratios.

27. Much water infrastructure has expected useful lifespans well over 20 years.

28. A water agency that considers commodity costs of hundreds or thousands of dollars per acre foot even for a short time will see a very different cost effectiveness result than if that agency looked at capacity cost alone.

29. Water smart meters may offer significant water (and so energy) savings by, among other things, providing real-time feedback on water use. A smart meter can, under some circumstances, indicate immediately if there is a leak at a customer premises.

30. Water IOUs should establish memorandum accounts to track expenses for water-energy nexus projects.

31. Introducing another utility into the evaluation of a measure's costs and benefits requires determining which utility bears what amount of a program's cost. Similarly, benefits must be allocated in a multi-utility scenario.

32. An energy corporation values avoided embedded energy costs when evaluating a water-saving program. A water corporation values avoided water costs.

Conclusions of Law

1. The Commission has jurisdiction to authorize and/or mandate that jurisdictional water, gas, and electric corporations use the tools or the tools' outputs in connection. *See* Public Utilities Code § 701, §§381.1 et seq., and § 454.5(b)(9)(c).

2. The Commission has jurisdiction to require jurisdictional water, gas, and electric corporations to provide data for incorporation into the tools. *See* Public Utilities Code §§ 581 et seq.

3. It is reasonable for the tools' default values to reflect data averaged across a DWR hydrologic region and for defaults averaged across hydrologic regions to be user-editable.

4. The tools correctly consider costs for the *marginal* water supply (e.g., recycled water) rather than average supply.

5. The tools correctly consider only the *long-run* marginal water supply.

6. It is reasonable for the tools to use a default assumption that 2016 will be the "resource balance year" -- the year in which additional water capacity is needed – and for this default to be user-editable.

7. The W-E calculator's approach to load profiling is reasonable.

8. Commission-jurisdictional energy utilities should neither be tasked with nor credited for achieving energy savings for non-jursidictional energy utilities.

9. It is reasonable for the tools to use data resources on energy intensity of pre-use treatment organized by DWR hydrologic region as a default, and for and for this default to be user-editable.

10. It is reasonable for the tools to use data resources on from CPUC embedded energy Studies 1 and 2 and other secondary studies and applies averaged by DWR hydrologic region for avoided distribution embedded energy and avoided wastewater conveyance treatment embedded energy, and for and for these defaults to be user-editable.

11. It is reasonable for PAs to have the option to assert an EUL of up to 30 years for removed equipment.

12. It is reasonable that the W-E calculator allows for consideration of commodity cost when calculating savings benefits for the water agency. Users may input their estimated future commodity costs into the W-E calculator, which uses the data to calculate benefits from water conservation measures.

13. When determining the cost effectiveness of a multi-utility efficiency program, we must determine whether the benefits of the reduced energy consumption flow to the utility customers that are paying for the program.

14. It is reasonable to allocate participant costs for a water-saving measure or program in proportion to the benefits that energy and water utilities each receive from a measure or program.

15. It is reasonable to allocate to an electric corporation participating with a water corporation in a water-saving program the value of the embedded electricity in all water saved. Likewise, for the water corporation (if jurisdictional) we will allocate to the water corporation the water capacity and commodity value (if any) of all the water saved.

16. A PA's energy efficiency spending must "be cost-effective as a whole portfolio, in which the cost of measures with a low TRC is offset in the portfolio by the higher savings of measures with high TRC."

17. There is inadequate justification for us to impose requirements here that (a) individual water-energy measures or programs be cost-effective, and/or (b) spending on water-energy programs not exceed certain dollar levels.

O R D E R

IT IS ORDERED that:

1. Commission-jurisdictional water utilities may use the Water-Energy Calculator and the Avoided Water Capacity Cost Model in connection with requests for ratepayer funding for any water saving measures/programs.

2. Energy efficiency Program Administrators shall use the Water-Energy Calculator and the Avoided Water Capacity Cost Model in preparing their requests for ratepayer funding for measures/programs that reduce water use and thus save embedded energy.

3. Energy efficiency Program Administrators (PAs) may depart from the Water-Energy Calculator and the Avoided Water Capacity Cost Model (collectively, tools) defaults where the tools allow. Where PAs depart from default values, they bear the burden of proving the departure(s) reasonable in all documents submitted to Commission Staff.

4. The Commission delegates to Commission Staff responsibility for integrating the Water-Energy Calculator with the Avoided Water Capacity Cost Model. To the extent that this requires consultant support, we authorize Commission Staff to retain consultants and to fund such consultants from evaluation budgets. Funding for the evaluations will be proportional to program expenditures, as adopted in past energy efficiency decisions.

5. When overriding default values in the Water-Energy Calculator and the Avoided Water Capacity Cost Model (collectively, tools), users should continue to use values for a marginal supply; rather than for historical/existing supplies, when using the tools in connection with anything that the Commission is reviewing in a proceeding or advice letter.

6. We approve the following program and measure impact values for water-energy projects:

(a) Locked in default net-to-gross ratio[97] of .85; and
(b) Available maximum expected useful life of 30 years for removed equipment.

7. Evaluation of existing or new water energy programs will be conducted by the Commission, and included and prioritized in the next update to the energy efficiency master joint evaluation, measurement, and verification (EM&V) plan. Oversight and vetting of study plans and results will follow the protocols

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97 "Net energy program impacts represent the amount of energy attributable to a program after adjustments for free-ridership. Gross energy program impacts represent the amount of change in energy consumption and/or demand that results directly from measures installed in the program without adjustments for attribution. NTG ratios refer to the ratio or percentage of net program impacts divided by gross or total impacts. NTG ratios are used to estimate and describe the free-riders that may be occurring within EE programs." (D.14-10-046, at 65 (internal citations omitted).)

articulated in the master EM&V plan. Funding for the evaluations will be proportional to program expenditures.

8. Pacific Gas and Electric Company, San Diego Gas & Electric Company, Southern California Edison Company, Southern California Gas Company, and the California Water Association shall work together with Commission Staff through an ideation process,[98] and within 90 days of the mailing date of this decision Pacific Gas and Electric Company, San Diego Gas & Electric Company, Southern California Edison Company, Southern California Gas Company, and the California Water Association shall jointly file as a tier 2 advice letter one or more pilots on Advanced Meter Infrastructure (AMI) integration. The goal for the pilot(s) shall be identifying technical issues with a water corporation "piggybacking" on electric corporation and/or gas corporation AMI infrastructure.

9. Water corporations are authorized to establish memorandum accounts to record expenses incurred for water-energy nexus projects through a Tier 1 advice letter filing.

[98] The Ideation Process is an informal process developed jointly by Commission staff and IOUs to facilitate development and reporting of new projects.

10. Rulemaking 13-12-011 remains open to address other issues identified in the scoping memo.

This order is effective today.

Dated ____________________________, at San Francisco, California.